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## REMARKS

The Examiner objected to claim 5. Office Action, page 2. Claim 5 has been amended to overcome this rejection.

The Examiner rejected claims 1, 2 and 9-21 as anticipated by Acharya et al. Office Action, pages 2-3. Applicants have canceled claim 1 and amended claims 2 and 9-21 to overcome this rejection.

The Examiner argues:

> Regarding claims 13-21, the Examiner notes that the time to achieve steady state (or "near steady state") is not purely a function of the medium, per se, but is a function of the magnetic head spacing, the recording density and the seek and/or access time of the magnetic head apparatus (*See Tam et al., col. 2, lines 5-39; col. 3, lines 41-52; and col. 10, line 29 bridging col. 11, line 6).* Since the claimed time to reach near steady-state magnetization is not a property of the medium, per se, the Examiner has given it little or no weight in determining the patentability of the product....

Office Action, pages 3-4. Applicants have amended claim 13 to clarify that the claimed apparatus includes a disk in which

> wherein the relationship between the dynamic coercivity of the lower magnetic layer structure and the exchange field is such that after termination of application of a write magnetic field to a location on the disk the portion of the lower magnetic layer structure at said location achieves substantially its steady magnetization state within the time required for one revolution of said disk.

The ability of a disk drive to meet this parameter does not depend upon the head spacing, the seek time or the access time. (The seek and access time pertains to how long it takes to position the head over a particular track. The above-quoted limitation pertains to how long it takes the magnetization of the lower magnetic layer to reach its steady magnetization state after the head applies a write magnetic field.) If the Examiner desires

evidence on this point, the Examiner is requested to telephone Applicants' attorney at (408) 732-9500, and Applicants will submit appropriate evidence.

In any event, even if the ability of a disk to exhibit the behavior described in claim 13 depends on certain characteristics of the disk drive in which the disk is incorporated (e.g. the rotation speed), claim 13 is now directed to a disk drive. There is no longer any reason to not accord weight to the above-quoted limitation in claim 13. Thus, claim 13 should be allowed. Claims 14, 15 and 17 should be allowed for similar reasons. (Claim 16 has been canceled.)[1]

Claim 15 recites:

> A lowest magnetic layer structure is formed above said substrate, a second intermediate layer comprising Ru is formed between said lowest magnetic layer structure and said lower magnetic layer structure, and said lowest magnetic layer structure is antiferromagnetically coupled to said lower magnetic layer structure.

The Office Action fails to point out where this subject matter is taught or suggested by Acharya. Accordingly, claim 15 should be allowed.

Claim 19 recites:

> an upper magnetic layer structure formed over the intermediate layer, said upper magnetic layer structure being antiferromagnetically coupled to the lower magnetic layer structure, data being recorded in said magnetic layer structures, wherein the relationship between the dynamic coercivity of the lower magnetic layer structure and the exchange field is such that after termination of application of a write magnetic field to a location on the disk a portion of the lower magnetic layer structure at said location achieves substantially its steady magnetization state within 15 milliseconds.

As mentioned above, the ability of a disk to exhibit the ability to achieve "substantially

[1] The Office Action states that the time required to achieve steady state magnetization depends on the recording density. (To be more precise, the time required to achieve steady state magnetization depends on the demagnetization field, which in turn depends on the size of the magnetized region in a disk.) Since claim 13 is limited to a disk in a disk drive having data recorded therein, the Examiner's argument concerning data recording density has been overcome in that there is no longer any reason to ignore limitations in claim 13.

its steady magnetization state with 15 milliseconds" "*upon termination of* application of a write magnetic field to a location on the disk" does not depend on head spacing, the seek and/or access time. Regarding the Examiner's argument that the time required to reach stabilization also depends upon the recording density, see footnote 1. Note that claim 19 recites that data is recorded in the disk. Thus, there is no reason to not give weight to the above-quoted passage from claim 19. Claims 20 and 21 are patentable for similar reasons.

The Examiner rejected claims 1, 2, 10-21 and 27-39 "as being anticipated by Trindade et al. (U.S. Patent App. No. 2003/0035973 A1) as evidenced by Nakamoto et al. (U.S. Patent No. 6,456,466 B1 and Tam et al. ('809)." Office Action page 4. As mentioned above, claims 1 and 10-12 have been canceled, and claims 2-9 depend (either directly or indirectly) on claim 13.

Regarding claims 13-21 and the claims dependent thereon, Applicants submit herewith a Declaration Pursuant to Rule 37 CFR 1.131 demonstrating that the claimed invention was made prior to August 14, 2001.

Claims 27, 33 and 38 as amended (and the claims dependent thereon), distinguish over Trindade. In particular, these claims recite a lower magnetic layer structure antiferromagnetically coupled to an upper magnetic layer structure such that the magnetization direction in the upper magnetic layer structure is opposite to the magnetization direction in the lower magnetic layer structure, wherein the upper magnetic layer structure comprises a data recording layer. Trindade's data recording layer 41 is not antiferromagnetically coupled to layer 40 such that the magnetization

direction in layer 40 is opposite to the magnetization direction of layer 41. Therefore, claim 38 distinguishes over Trindade.

The Examiner rejected claim 9 "under 35 U.S.C. 103(a) as being unpatentable over Trindade et al. as evidenced by Nakamoto et al. and Tam et al. as applied above, and further in view of Chang et al." Office Action, page 8. Claim 9 has been amended to depend on claim 13, and is patentable at least for the reasons set forth above with respect to claim 13.

The Examiner rejected claims 3-8 "under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Doerner et al. ... and Shinohara et al...." Office Action, page 9. Claims 3-8 have been amended to depend, either directly or indirectly, on claim 13, and are patentable for at least the reasons set forth above with respect to claim 13.

The Examiner rejected claims 22-26 "under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Kikitsu et al. (U.S. Patent App. No. 2001/0051287 A1), Igarashi et al. (U.S. Patent App. No. 2002/0132140 A1) and Acharya et al. (Proc. Given at Joint Euro. Mag. Symp., Grenoble, France, 9/2001)." Office Action, page 10. The Office Action states:

> Acharya et al. fail to disclose using a lower magnetic layer structure comprising a Ku of less than 0.5 x $10^6$ erg/$cm^3$ (claims 23).
>
> However, Kikitsu et al. and Igarashi et al. teach that in a dual layered recording medium, it is desired to form the lower magnetic layer with a Ku that is smaller than the upper magnetic layer, preferably less than 70% of the Ku value of the upper magnetic layer, inorder (sic) to achieve good resolution and good resistance to thermal fluctuations, as well as the ability to achieve recording with magnetic heads currently in use (*Kikitsu et al., Paragraphs 0219-0225 and 0235; and Examples 11-17; and Igarashi et al., Paragraph 0041*). In addition, Acharya et al. (Proc. At Joint Euro. Mag. Symp.) illustrates that using a lower layer with a Ku

> $< 0.5 \times 10^6$ erg/cm$^3$ results in a layer with a KuV/KbT behavior that was insensitive to the layer thickness.

Office Action, pages 10-11. Applicants traverse this rejection because Acharya teaches directly away from Applicants' invention. Applicants first direct the Examiner's attention to the page of Acharya entitled "The Effect of Ku and Thickness of L1 Layer – Discussion". This page states that a higher Ku yields "better thermal stability." Similarly, the last page of Acharya (entitled "Summary") states: "Using stabilization layer with higher Ku, SFM performance can be enhanced...." In other words, Acharya teaches directly away from having a low Ku. Therefore, Acharya could not possibly teach or render obvious Applicants' claimed invention.

Igarashi also fails to teach or suggest Applicants' claimed Ku. Igarashi teaches that his lower layer Ku exceeds 0.4 times the upper layer Ku. See, for example, Igarashi's abstract, ¶20, 47 and 42, and Fig. 9. This would lead one skilled in the art away from Applicants' claimed Ku.

Finally, Kikitsu does not teach or suggest Applicants' invention. Kikitsu ¶219-225 and 235 (cited by the Examiner) pertains to Kikitsu's eighth embodiment. (See ¶219.) This embodiment is described at ¶189-191 and Fig. 21. It lacks an upper magnetic layer disposed over an intermediate and a lower magnetic layer with antiferromagnetic coupling between the upper and lower magnetic layers. Thus, the physics of Kikitsu's structure, and the reason Kikitsu chose the elements of that structure are not pertinent to Acharya or Igarashi. In particular, at ¶219, Kikitsu explains that he wants his lower magnetic layer (what he calls his "functional layer") to reduce the overall coercivity of his disk. There is nothing in the cited art to teach or suggest that this would be of any advantage in an Acharya or Igarashi disk (comprising antiferromagnetically

coupled magnetic layers). Therefore, there is no reason why one skilled in the art, given Kikitsu and the other cited art, would try to combine them as suggested by the Examiner.

The Examiner rejected claims 27-37 "under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Richter et al. (IEEE Trans. Mag., 34(4), 1998, 1540-1542 and Richter et al. (IEEE Trans. Mag. 37(4), 2001, 1441-1444)." Office Action page 11. The Examiner argues:

> Acharya et al. fail to disclose controlling the dynamic coercivity (claims 27-32) nor the short-time coercivity (claims 33-37) such that they are less than the exchange force (or less than half the exchange force).
>
> However, Richter et al. (both references) teach that it is desired to minimize the short-time coercivity and the dynamic coercivity to insure a small difference between writing coercivity and the storage (long-time) coercivity inorder avoid writing problems (sic) by avoiding the superparamagnetic limit associated with high coercivity values at short times (*Introduction sections of both references and Figures in the 1998 reference).*

Office Action, page 12. Applicants respectfully submit that the Office Action misinterprets Richter. Claim 27 recites:

> the dynamic coercivity of the lower magnetic layer structure being greater than or equal to zero but less than the exchange field between the upper and lower magnetic layer structures.

Richter merely discusses the coercivity of the upper magnetic layer. This has nothing to do with the coercivity of the lower magnetic layer, or the relation between the lower magnetic layer coercivity and the exchange force. Therefore, this rejection should be withdrawn.

The Examiner rejected claims 38 and 39 "under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further

in view of Igarashi et al. ('140 A1) and Carey et al. (U.S. Patent App. No. 2003/0022023 A1)." The Examiner argues:

> Acharya et al. fail to disclose a lower magnetic layer structure comprising a magnetically soft material with intergranular decoupling selected from the group listed in claim 39.
>
> However, the Examiner deems that the CoCrPtB magnetic alloys and magnetically soft materials with intergranular decoupling, i.e. permalloy, are known equivalents in magnetic materials for use in the lower magnetic structure of antiferromagnetically coupled recording medium. Specifically, Igarashi et al. teach antiferromagnetically coupled recording medium wherein the lower magnetic layer ... can comprise CoCrPt alloys, as well as known soft magnetic materials "FeNiCo, CoFeTa, NiTa, CoW, CoNb, ... Fe-N" (Paragraph 0036).

Office Action, page 13. This is incorrect. While it is possible to make FeNiCo, CoFeTa, NiTa, CoW, CoNb and FeN so that they are magnetically soft, it is also possible to make these alloys so that they are not magnetically soft (depending upon alloy composition). In the context of Igarashi, these alloys are not magnetically soft. As pointed out above, Igarashi teaches away from having the coercivity of lower magnetic layer 12 being too low. (See Igarashi paragraph 41.)

The Examiner further argues:

> Carey et al. teach the materials meeting applicants' claimed Markush limitations are known equivalent to the alloys listed by Igarashi et al. (Paragraph 0024: "In addition to CoFe, other magnetically permeable materials suitable for the FM layers are alloys of CoNiFe, FeCoB, CoCuFe, NiFe, FeAlSi, FeTaN, FeTaN, FeN, FeTaC, CoTaZr, CoFeB, and CoZrNb).

Office Action, pages 13-14. This is incorrect. Depending upon alloy composition, Carey's materials are magnetically soft. However, they are not the same materials, and do not have the same properties as Igarashi's materials. Further, as mentioned above, Igarashi teaches away from a magnetically soft underlayer. Therefore, it would not be obvious to combine Acharya, Tam, Carey and Igarashi as suggested by the Examiner.

Applicants have amended claim 38 to refer to longitudinal magnetic media. Carey pertains to vertical media. Underlayers in perpendicular media serve a purpose that is different from underlayers in Applicants' claimed media. This is another reason why claims 38 and 39 distinguish over the cited art.

Applicants have added claims 40-45. These are method claims corresponding to structure claims 13 and 17-21, respectively. They are patentable at least for the reasons set forth above.

Concerning claims 13-21, Applicants direct the Examiner's attention to Igarashi page 2, upper third of the right hand column and Igarashi ¶10, first sentence. The attached Declaration Pursuant to Rule 37 CFR 1.131 shows that the subject matter of these claims was invented prior to Igarashi's filing date.

As claims 2-9, 13-15 and 17-49 distinguish over the cited art, Applicants respectfully submit that the application is in condition for allowance. If the Examiner's next action is other than allowance, the Examiner is respectfully requested to telephone Applicants' attorney at (408) 732-9500 for a telephone interview.

Respectfully Submitted,

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